

PATENT APPLICATION

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. Application No. 09/162,103

--25. The electron microscope of claim 24, wherein at least one of said minicolumns has a tilt with respect to the other minicolumns.

--26. The electron microscope of claim 25, wherein said tilt is variable.--

IN THE ABSTRACT:

Page 14, line 3, after "disclosed" insert --,--;

line 5, after "introduced" insert --into--.

REMARKS

Claims 1-26 are all the claims pending in the subject application, claims 18-26 having been added to claim the disclosed invention more completely. The foregoing amendments to claims 1-17 have been made to clarify the language used, and are not made in response to any rejection.

Claims 1-17 stand rejected under 35 U.S.C. § 112, first paragraph. Claims 1 and 12 further stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fink '711 or Kruit '586 in view of Bubeck et al. "Miniature Electrostatic Lens ... Electron Probe." Applicants respectfully traverse these rejections, and request reconsideration and allowance in view of the following arguments.

Looking first at the rejection under 35 U.S.C. § 112, first paragraph, Applicants note that the Examiner has identified several deficiencies in the application, as follows:

1) The Examiner has objected to an alleged lack of full disclosure of a detection means for an electron microscope. Applicants do not understand how this objection is relevant, insofar as a detector or detection means is not claimed.

Notwithstanding the foregoing, it appears that the Examiner has raised two questions with respect to the detection means. The first is whether the electron microscope is a transmission electron

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microscope (TEM) or a scanning electron microscope (SEM). Applicants respectfully submit that this question is not relevant. It is well known that a TEM and an SEM inspect different kinds of specimens, and provide different kinds of images, based *inter alia* on the nature of the specimen being examined. For a TEM, the detector will be placed on an opposite side of the specimen from the electron source, and the specimen must be such as to enable electrons to pass therethrough to reach the detector. For an SEM, the detector will be placed so that electrons reflected off the specimen will strike the detector.

With that difference in mind, and with the clear knowledge in the art that SEMs and TEMs employ a column through which the electron beam passes, to a chamber housing a specimen to be examined, suitable placement of the detector would be well within the abilities of the ordinarily skilled artisan to implement.

The second question that the Examiner has raised is where the detector would be placed with respect to a turntable stage. Again, Applicants believe it is clear that the ordinarily skilled artisan would know that, for example, for an SEM the detector could be positioned within the minicolumn, and thus could move with the minicolumn for detecting electrons. Placement of a detector within the column is shown, for example, in an article by Chang et al entitled "Electron beam technology - SEM to microcolumn" (*Microelectronic Engineering* 32 (1996) 113-130). A copy of this article is provided herewith.

Applicants understand the Examiner to be identifying a concern in which detector location can have an effect on how the present invention would be implemented, and so that location needs to be described explicitly. However, Applicants submit that the ordinarily skilled artisan in the area of electron microscopy would recognize immediately that, depending on the type of electron microscope in which the present invention is used (e.g. SEM or TEM), implementation of the invention can be

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adjusted accordingly, to compensate not only for detector location, but also for specimen holder location and the like. Such adjustment is well within the abilities of the ordinarily skilled artisan, and the Examiner has not even made out a *prima facie* case to the contrary.

2) The Examiner has objected to an alleged lack of disclosure of a load lock mechanism. Applicants find it difficult to tell whether the Examiner is objecting to a lack of disclosure *per se*, or just to whether a load lock mechanism is shown in Fig. 7.

As is well known, the purpose of a load lock is to allow the insertion of a specimen to be examined into a vacuum chamber without breaking the vacuum. The structure and function of such load locks is well known, and well within the abilities of the ordinarily skilled artisan to implement. Accordingly, Applicants believe that nothing is required by way of disclosure of this feature, beyond what already is shown in the specification. An exemplary load lock mechanism is shown in Fig. 1 for introducing a specimen into a chamber and removing the specimen from the chamber. The other Figures of the application also show chambers, for which provision of a load lock mechanism is as straightforward as in Fig. 1. Applicants believe that such discussion is equally applicable to the embodiment of Figs. 7A or 7B.

3) The Examiner asserts that the dimensions for the specimen chamber or mini-environmental housing are not disclosed. Applicants note first that the Burstert and Bubeck articles are referred to in the specification (top of page 3) for additional details of the minicolumn, beyond the dimensional ranges for the lens structure described on page 2 of the specification. Further, the just-mentioned Chang article, as well as USP 5,155,412 and 5,122,663 teach the sizing of columns for electron microscopes, the '412 and '663 patents talking *inter alia* about compact electron optics which are used in electron microscope columns.

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In light of this disclosure, Applicants believe it is clear to the ordinarily skilled artisan that the dimensions of the lenses in the column, to a significant extent, define the size of the column.

With respect to the dimensions of the specimen chamber relative to the dimensions of the mini-environment and minicolumn, it is believed abundantly clear that the ordinarily skilled artisan, seeking to implement the teachings of the present application, would apply not only an ordinarily skilled artisan's abilities, but also common sense. There would have to be room for tilt, or for suitable detector placement (the above-mentioned Chang article showing examples of detector placement within the column).

Looking at the "common sense" point a little more closely, SEMs and TEMs, for example, have columns of known sizes. The dimensions of the invention obviously would be selected with consideration given to the type and size of the objects to be inspected, the mechanisms contained within the vacuum chamber to transfer the specimen from the load lock to the stage, the mechanisms contained within the chamber to move the stage in an x-y plane such that the entire specimen may be examined, mechanisms contained within the chamber to move (for example) the isolation valve 450 shown in Figures 4A and 4B, and the mechanisms contained within the chamber to tilt minicolumns or to pivot arms for mounting minicolumns.

From the foregoing, Applicants believe that it is apparent that considerations such as fitting the minicolumn into either an SEM or a TEM (depending on the detector); provision of a load lock mechanism to facilitate insertion and removal of samples without breaking vacuum in the minicolumn; and dimensions of the minicolumn all are within the abilities of the ordinarily skilled artisan. In light of the knowledge and abilities of the ordinarily skilled artisan, as evidenced *inter alia* in the articles and patents referred to in the specification and above, Applicants submit that the Examiner has failed to

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make out even a *prima facie* case of non-enablement. Such a case requires more than the assertions set forth in the rejection. Consequently, Applicants submit that the specification is enabling, and accordingly Applicants request reconsideration and withdrawal of the 35 U.S.C. § 112, first paragraph rejection.

Looking now at the prior art rejection, Applicants note first that the Examiner has rejected only claims 1 and 12 based on prior art. Therefore, should the Examiner reject other claims in a subsequent Office Action based on prior art, Applicants submit that such rejection cannot properly be made final.

Neither Fink '711 nor Kruit '586 teaches anything about a minicolumn. Fink '711 describes a low voltage source for electron beams, and further describes the apparatus for generating the electron beam being in an ultra-high vacuum (column 3, lines 21-23.) There is no "column" disclosed, as that term is used in electron microscopy, much less a minicolumn. Applicants fail to see how the reference to a foil 13, specimen 16, and detectors 18, 19 in Fig. 2 of Fink, even taken in the context of the overall disclosure of Fink, says anything about the dimensions of the device.

Kruit shows a column in Fig. 1, but the lens structure alone clearly is large, and is in no way a minicolumn. Fig. 5 does not show a column at all, much less a minicolumn.

Bubeck teaches the construction of an electron beam source, and in particular a miniature lens structure. However, neither Fink '711, nor Kruit '586, nor Bubeck teaches the placement of a minicolumn in a mini-environment, recited separately from a main chamber, as set forth in claim 1. Moreover, none of these references discloses a turntable stage, as recited in claim 12, and so cannot teach or suggest the claimed structure of a combination of a turntable stage, a holding arm, and a minicolumn attached to the holding arm.


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Pursuant to the foregoing discussion, Applicants submit that claims 1-17 in the subject application are patentable.

The Examiner's rejections having been overcome, Applicants submit that the subject application is in condition for allowance. The Examiner is respectfully requested to contact the undersigned at the telephone number listed below to discuss other changes deemed necessary. Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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Date: October 26, 2000

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

Assistant Commissioner for Patents
Washington, D.C. 20231

Date: October 26, 2000

Signed: Thea K. Wagner
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